

Enclosure

STATUS REPORT ARCHITECTURAL COATINGS SUGGESTED CONTROL MEASURE December 2002

Districts Adopting the SCM

Background

In June 2000, the Board approved a Suggested Control Measure for Architectural Coatings (SCM), a blueprint on which new district architectural coating rules could be based. Since the ARB does not have regulatory authority for architectural coatings, the districts must individually adopt the SCM for it to become legally enforceable. Over the past decade, the districts have been reluctant to amend their architectural coatings rules because of a series of lawsuits following their adoption of the 1989 SCM. Yet, architectural coatings are a large source of volatile organic compound (VOC) emissions. In 2000, architectural coatings were estimated to emit about 120 tons per day of VOCs in California, on an annual average basis.

The SCM is based on the first tier VOC limits of the South Coast Air Quality Management District's (SCAQMD) Rule 1113 – Architectural Coatings, which was amended in 1996 and 1999. A second tier of future-effective limits in the SCAQMD rule, that become effective in 2005-2008, are not included in the SCM. Most of the new SCM limits become effective on January 1, 2003. When fully implemented in 2004, the statewide VOC emission reductions from implementing the SCM will be more than ten tons per day, excluding the SCAQMD.

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Districts Adopting the SCM

Over the last 18 months, 16 districts have adopted or amended their architectural coating rules to reflect the SCM. The districts adopting the SCM are as follows: Sacramento, San Joaquin Valley, Ventura, Yolo-Solano, Santa Barbara, Bay Area, San Diego, Placer, San Luis Obispo, Northern Sonoma, Monterey, Butte, Shasta, Colusa, Tehama, and Feather River. The SCAQMD intends to open its rule in 2003 to consider provisions that differ from the SCM. More than 95 percent of the people of California are covered by an architectural coatings rule with the new, more stringent limits of the SCM.

Three districts (San Joaquin Valley, Yolo-Solano, and Ventura) adopted the SCM to fulfill 1994 State Implementation Plan (SIP) commitments. Five of the districts (Yolo-Solano, San Luis Obispo, Northern Sonoma, Shasta, and Tehama) adopted an

architectural coatings rule for the first time. Three districts (Glenn, Mojave, and Antelope) are either working on or are considering adopting the SCM soon; Glenn, which has a hearing scheduled for December 17, 2002, will be adopting an architectural coating rule for the first time. Three districts (Imperial, Kern, and El Dorado) with existing architectural coatings rules are still considering whether to revise their older rules. The remaining 12 districts not adopting the SCM, comprising about five percent of the State's population, are subject to the United States Environmental Protection Agency's (U.S. EPA) National Volatile Organic Compound Emission Standards for Architectural Coatings (National Rule), which has considerably higher limits than the SCM.

All of the districts adopting the SCM included an averaging compliance option which is similar to SCAQMD's averaging provision, but contains a sunset date of January 1, 2005. Almost all districts prepared environmental impact documents based on the ARB's Program Environmental Impact Report (EIR) (ARB, 2000b). To date, six districts (San Joaquin Valley, Ventura, Yolo-Solano, Santa Barbara, Bay Area, and Monterey) have submitted their rules to U.S. EPA as SIP revisions.

A limited number of issues were raised during the district rule development process. The National Paint and Coatings Association (NPCA) sent copies of previous comment letters to some of the bigger districts, challenging the technical feasibility of some of the limits. Dunn-Edwards Corporation representatives attended most workshops and hearings to go on record that they object to the averaging provision's sunset and ceiling limits, and urged districts not to submit the rule as a SIP revision. Sherwin-Williams and Dunn-Edwards representatives commented, in a number of districts, about the need for a phase-in period to comply with new limits. They claimed that companies need a six-month time frame to comply with lower limits and labeling requirements. Most districts did allow a three- to six-month phase-in period for any limits that were lowered upon adoption of the rule. Districts addressed all comments without making major changes to the SCM language.

Overall, the districts encountered minimal opposition to adopting the SCM. ARB staff was involved in each district's process by reviewing documents, attending workshops, testifying at hearings, and assisting in addressing comments. The goal of the ARB's involvement was to maintain district uniformity in the rule language.

SCAQMD Lawsuit

Following the 1996 and 1999 amendments to Rule 1113, a number of lawsuits were filed against the SCAQMD by the paint industry. The District prevailed in these lawsuits, until June 24, 2002, when the California Court of Appeals reversed a favorable 2001 decision of the Orange County Superior Court. In an unpublished decision, the appellate court directed the lower court to enter a new judgment, directing the SCAQMD to vacate its adoption of the 1999 amendments. This decision was based on process, rather than technical issues, because the District had added a category for essential

public service coatings ten days before the hearing, and allowed small businesses an extra two years to comply with the interim VOC limits (SCAQMD, 2002c).

The May 1999 version of the rule remains in effect until the Superior Court issues the order to vacate the 1999 rule, and revert back to the November 1996 version of the rule. The District filed an appeal with the State Supreme Court to reverse the appellate court decision, but the higher court declined to hear the case. In August 2002, the District also issued a notice to readopt the 1999 rule amendments on November 1, 2002, although this date was extended to December 6, 2002. The SCAQMD Governing Board readopted the 1999 rule amendments on December 6, 2002. The rule revisions primarily relate to the vacated rule, although a few changes were made for clarification, to change compliance dates, and to address changes requested by the ARB and the U.S. EPA (SCAQMD, 2002c).

The decision against the SCAQMD did not affect the districts adopting the SCM. No lawsuits have been filed against any district adopting the SCM.

Ozone Transport Commission

The SCM is also having an impact beyond California's borders. In 1999, the SCM came to the attention of the Ozone Transport Commission (OTC), made up of the 13 eastern seaboard states from Virginia to Maine. The OTC was interested in a technologically feasible rule that would achieve more emission reductions than the National Rule. ARB staff worked with OTC staff in developing a model paint rule that is based on the SCM, and also provided technical assistance as issues arose during the model rule development process. The State of Delaware adopted the model rule in February 2002, and Pennsylvania, New Jersey, New York, and Maryland also plan to adopt the rule soon.

The Delaware rule is currently being challenged by NPCA and several paint manufacturers. Delaware State law requires that challenges to environmental rules be brought before a citizen review panel at an Environmental Appeals Board hearing. Any appeals from this process are brought before the Delaware Superior Court. The Environmental Appeals Board hearing will be in early December 2002. Because of the precedent-setting nature of this hearing for both OTC states and California districts, ARB staff will provide expert testimony at this hearing.

Averaging Compliance Option

Background

In the 1996 amendments to Rule 1113, the SCAQMD added a voluntary averaging provision for flat coatings (SCAQMD, 1996). This option allowed manufacturers to continue selling flat coatings that exceeded the VOC limit if excess emissions from these coatings were offset by sales of overcomplying coatings. Averaging was added to the rule in response to an industry request for market-based approaches to comply with the limits. The averaging provision was based on the ARB's Alternative Control Plan for consumer products (ARB, 1994). On June 21, 1999, the U.S. EPA published an approval of the SCAQMD's 1996 rule amendment as a revision to the California SIP (U.S. EPA, 1999).

In the 1999 Rule 1113 amendments, SCAQMD staff modified the averaging provision to allow ten more coating categories with future effective limits to be averaged (SCAQMD, 1999). SCAQMD staff also revised the method of calculating emissions from the coatings, and clarified the requirements for participation in the program. A reconciliation plan, requiring manufacturers to reconcile any shortfalls from the planned emission reductions, was removed from the rule at that time.

During the development of the SCM, the inclusion of an averaging compliance option was considered as a project alternative in the EIR (ARB, 2000b). Staff noted that an averaging program would need to: (1) preserve the emission reductions that would be achieved by the VOC limits by the sunset date; (2) maintain enforceability of district rules; and (3) provide flexibility and a more cost-effective way for manufacturers to comply with the district architectural coating rules. A Dunn-Edwards representative indicated that averaging was an essential component of the SCM, because without averaging, the proposed VOC limits were not technologically feasible (Berman, 2000). A Sherwin-Williams representative also supported averaging to allow the company to continue to sell important higher VOC products that they were unable to reformulate (Harding, 2000). Although the staff does not agree that the limits are technologically infeasible without averaging, a temporary averaging provision was added to the SCM for consideration by the Board on June 22, 2000.

Because most districts have insufficient resources to manage an averaging program, they requested that the ARB administer the program. In addition, it would be resource-intensive for manufacturers to submit programs and track coating distribution in individual districts. The California Air Pollution Control Officers Association took a position supportive of statewide averaging, to be managed by the ARB, as long as the district SIP commitments could be met, and the averaging provision could be adequately enforced (CAPCOA, 1999).

The SCM's averaging program is identical to that in SCAQMD Rule 1113, except that the SCM's averaging program sunsets on January 1, 2005. The sunset was added to ensure that districts meet 2005 SIP commitments. The technical and environmental

analysis for the SCM was applicable with or without an averaging provision because the analysis assumes that averaging will not be used (ARB, 2000b). Although the staff does not believe averaging is necessary to comply with the VOC limits in the SCM, some manufacturers suggest that a replacement flexibility option, such as extended averaging or a reactivity-based regulation, needs to be in place when the averaging provision sunsets.

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Averaging is a voluntary provision that allows manufacturers to average, on a volume-weighted basis, emissions of higher-VOC products with those of lower-VOC products, as long as the allowable emissions are not exceeded. The purpose of averaging is to provide more flexibility to manufacturers to comply with district rules. The following coating categories are eligible for averaging: floor coatings; primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; quick-dry enamels; rust preventative coatings; roof coatings; bituminous roof coatings; stains; waterproofing sealers; industrial maintenance coatings; flats; and nonflats.

Participating manufacturers submit an averaging program detailing how they will distribute specific higher-VOC and lower-VOC products to demonstrate that actual emissions do not exceed the allowable emissions under the rule limits. For compliance purposes, each can of higher-VOC product must be labeled to indicate that the product is included in an averaging program. Periodic reports are required that quantify the actual and allowable emissions for the product volumes distributed under the program. If the manufacturer exceeds allowable emissions during the averaging period, it must take steps to mitigate the violation of the program. The districts can collect penalties for program violations. The district rules provide a framework and general requirements for the program, but details of how each manufacturer complies with the rule are contained in separate guidance documents. The SCAQMD developed an averaging guidance document for Rule 1113 (SCAQMD, 2000a) that addresses specifics such as the application and compliance period; labeling requirements for products; reporting requirements; non-compliance; and renewal, modification, and termination of the program.

During the development of the SCAQMD guidance document, an issue arose that required a letter of clarification from the ARB to the districts (Kenny, 2001a). The original intent of the averaging provision was that the maximum VOC contents for products included in an averaging program would be the pre-existing district limits. However, the language in the averaging provision approved in the SCM and adopted by the SCAQMD did not include such language. Because the SCM needed to account for non-uniformity of district rule VOC limits, the most common district limit in effect prior to the adoption of the SCM was used as the averaging “ceiling,” or maximum VOC content, for any product included in the program. Also, in the SCM, a clarification of the sell-through language was added to specify that the three-year sell-through provision applies to higher-VOC coatings that are part of an approved averaging program. The

districts adopting the SCM included these clarifications, and the SCAQMD is revising its rule to include these provisions as well.

The ARB staff worked with the districts and industry to modify the SCAQMD guidance document to make it applicable statewide. Statewide averaging is possible because all districts (except SCAQMD) have exactly the same categories and limits. Statewide averaging also allows manufacturers to submit one averaging program, rather than developing a separate program for each district (except for SCAQMD). The Statewide Averaging Guidance Document (ARB, 2002a) is nearly identical to the SCAQMD document with the following exceptions: manufacturers would work with the ARB on their programs, rather than the individual districts; there would be no fees associated with an averaging program; and the districts would issue notices of violation. A Memorandum of Understanding (ARB, 2002b) between the ARB and the districts adopting the rule is being developed, to formalize the way the averaging provision is administered and enforced.

The staff introduced the statewide guidance document to industry in early June 2002, finalized it in August 2002, and published it in October 2002. The ARB and the SCAQMD are reviewing averaging programs to allow the SCAQMD to have input on programs that continue in the District after the statewide programs end. Manufacturers can either submit a statewide averaging program, applying the SCAQMD interim VOC limits statewide, or they can submit separate SCAQMD and statewide programs. The SCAQMD and ARB will issue separate letters approving or disapproving the averaging programs.

The SCAQMD approved three averaging programs for the flat limits that went into effect on January 1, 2001. For the 1999 rule amendments, the District has approved averaging programs from seven companies. To date, the ARB has received two statewide programs.

U.S. EPA Issues

Although the U.S. EPA approved the SCAQMD's 1996 amendments as a SIP revision, including the averaging compliance option, they have concerns about the version of averaging adopted in the 1999 amendments. In a May 13, 1999, letter to the SCAQMD (Steckel, 1999), the U.S. EPA expressed concerns about recordkeeping, federal enforceability, and the possible applicability of the U.S. EPA's Economic Incentive Program (EIP). The U.S. EPA wanted manufacturers who participate in averaging to be required to make up any emission reduction shortfalls. EIPs are measures designed to encourage cost-effective and innovative approaches to reduce air pollution, while maintaining the accountability and enforceability of traditional air quality management programs (U.S. EPA, 2001). The U.S. EPA finalized the EIP guidance document in January 2001.

The SCM did not contain an averaging provision until just prior to the Board hearing; thus, the U.S. EPA's comments on the SCM's averaging provision were not received

until the day before the ARB's hearing. The letter expressed essentially the same concerns as the 1999 letter to the SCAQMD (Steckel, 2000). The U.S. EPA also commented on the averaging provisions during the rule adoption process for some districts.

In late 2001, the U.S. EPA notified the SCAQMD and the ARB staffs that they intended to issue a limited approval and limited disapproval of the SCAQMD's 1999 amendments, as well as other districts' rules reflecting the SCM, based mainly on concerns with averaging. On September 20, 2002, the U.S. EPA published a proposed limited approval and limited disapproval for the San Joaquin Valley, Ventura, and Santa Barbara Districts' architectural coatings rules (U.S. EPA, 2002).

In the notice, the U.S. EPA identified what they believe are the primary deficiencies with the rules, including: (1) the lack of a definition of "formulation data", which is a term used in the rules; (2) allowing both the sell-through of coatings and an averaging compliance option; (3) allowing ARB to approve averaging programs when architectural coatings are under local jurisdiction; (4) the lack of specificity in the rules with regard to what constitutes acceptable records for verifying averaging compliance; and (5) the application of the violation provision of the averaging compliance option.

ARB staff does not agree with these stated deficiencies. More importantly, we do not believe that averaging deficiencies warrant rule disapproval, since the averaging programs will expire on January 1, 2005. The ARB staff, some of the districts, and industry have provided comments to the U.S. EPA on the proposed disapprovals. The ARB and the districts are continuing to work with the U.S. EPA on this issue.

2001 Architectural Coatings Survey

Background

State law requires the ARB to collect data to estimate atmospheric emissions. Health and Safety Code section 39607 specifies that the ARB is to inventory sources of air pollution in the State to determine the kinds and quantity of air pollutants present. The ultimate goal, stated in Health and Safety Code section 39701, is to control specific contaminants, in order to meet ambient air quality standards. State regulations require that these data be protected as confidential business information (California Code of Regulations, Title 17, section 91000 to 91002, and Government Code section 6250 et seq.).

To comply with this requirement, ARB staff periodically surveys manufacturers of architectural coatings sold in California, the most recent surveys being in 1993, 1998, and 2001. Any company that manufactures, sells, or distributes architectural coatings in California is required to complete these surveys. The data may be used to establish new VOC limits or to provide a baseline for future rulemaking. Ultimately, the data are placed in the ARB's emissions inventory for California, and are used to estimate and forecast emissions throughout California. The inventory, in turn, is used to monitor the State's progress in meeting the federal and State air quality planning requirements.

Since detailed information is gathered for each category of coatings, staff can identify and quantify advances in coatings technology, such as improved resins or additives, which improve the performance of lower-VOC coatings. The survey information also identifies coating categories for which technical problems may exist in meeting VOC limits. Finally, surveys can ensure that the industry receives credit for emission reductions already achieved, e.g., through voluntary reformulation of products in response to customer needs.

The 1998 architectural coatings survey was an important component of the 2000 SCM. In the SCM Staff Report (ARB, 2000a), survey data were reported for both solvent-borne and water-borne products to summarize relevant inventory information about each category. The following information was provided for each coating category:

- number of products reported in the category;
- total reported category sales (gallons);
- sales-weighted average VOC content reported; and
- yearly VOC emissions for the category.

From this information, VOC limits were proposed for each category, considering:

- number of products complying with the proposed limit;
- percentage complying marketshare (gallons sold) at or below the proposed limit; and
- emission reductions that would be achieved with the proposed limit.

The survey information, coupled with other technical information, provided the basis for establishing the technological and commercial feasibility of each proposed limit.

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The 2001 survey also provides the necessary detail to evaluate the feasibility of developing a reactivity-based control strategy by providing a baseline for the reactivity of architectural coatings. This baseline is important as the manufacturers begin reformulating products to meet the 2003 and 2004 limits. The 2001 survey is also an important tool for conducting technology assessments for the 2003 and 2004 limits.

Staff began work on the 2001 survey in late 2000. In early 2001, the draft survey was distributed to representatives of the major manufacturers, and a series of conference calls was held to work out the details of the survey. The 2001 survey was considerably more detailed than the 1998 survey in the following ways:

- Product names were required to allow staff to obtain product data sheets and to check on the availability of products in the marketplace.
- More information on the weight and volume percentages of solids and volatiles was requested so that VOC calculations could be verified.
- Substrate and resin information was requested, as in pre-1998 surveys, to allow for more detailed analysis of the survey data.
- The rules for grouping similar products were tightened from a 50 grams VOC per liter of coating (g/l) range in 1998 to a 25 g/l range in 2001.
- The range of VOCs reported for grouped products was requested.
- Respondents reported only the names of VOCs and exempt compounds (not resins or solids).
- Aggregated VOCs and exempt compounds were required to be speciated at the 0.1 weight percent level, compared to the one percent level in the 1998 survey.

The staff also made additions to the mailing list, adding companies specializing in certain niche categories that have been traditionally underreported. The survey was mailed on July 23, 2001 to about 700 companies, with a deadline of October 31, 2001.

Results of 2001 Survey

Of the over 700 surveys sent to companies, we received more than 500 responses, for about a 75 percent response rate. Of these responses, more than 300 were not required to complete the survey, because they (1) were not an architectural coating manufacturer, (2) did not sell architectural coatings in California in 2000, or (3) had another company reporting for them. The remaining 182 survey responses make up the survey data. This is an increase of 30 surveys from 1998.

Preliminary draft results of the 2001 survey were made available on the ARB's architectural coatings web site in October 2002. Following review and comment, a draft report will be published in early 2003. However, a few interesting facts are relevant here.

The top ten coating categories based on sales were: flat; nonflat-medium gloss; primer, sealer, and undercoater; nonflat-low gloss; industrial maintenance; traffic marking; bituminous roof; stains-clear and semitransparent; nonflat-high gloss; and quick dry primers, sealers, and undercoaters. Together, these categories account for almost 90 percent of coating sales reported.

The top ten coating categories based on emissions were: nonflat-medium gloss; industrial maintenance; flat; primer, sealer, and undercoater; stains-clear and semitransparent; quick dry primer, sealer, and undercoater; nonflat-low gloss; bituminous roof; varnishes-clear; and nonflat-high gloss. Together, these categories account for almost 80 percent of the emissions from the architectural coatings reported.

The top ten companies selling architectural coatings in California are (in alphabetical order): Behr Process Corporation; Dunn-Edwards Corporation; Frazee Industries; The Glidden Company (ICI); Henry Company; Kelly-Moore Paint Company; The Sherwin-Williams Company; Smiland Paint Company; TMT Pathway LLC; and Vista Paint Corporation.

The detailed data reported on this survey allows for more analysis of coatings usage and the resin systems that are most successful in low VOC coatings. The quality of the speciated VOC information will be useful to establish a baseline for a possible reactivity-based SCM. A reactivity-based SCM may offer the greatest ozone benefits that are cost effective in future coatings control measures.

Technology Assessments

Background

One of the most important aspects of developing the SCM is the technological and commercial feasibility assessment. In the staff report for the 2000 SCM (ARB, 2000a), the following sources of information were used: ARB's 1998 survey data; manufacturers' brochures, product data sheets, product labels, and material safety data sheets; Internet sites; books and trade magazines; technical reports; training manuals; test results and specifications (National Technical Systems and Harlan studies); U.S. EPA's supporting documentation for the National Rule; SCAQMD's Rule 1113 staff reports; meetings with resin manufacturers; interviews with manufacturers and users of coatings; district rules and discussions with district staff; previous SCM support documents; and information from trade associations.

The 1998 survey data were especially helpful in quantifying the number of products and the percentage of the reported sales that complied with the proposed limit for each coating category. All of the applicable information for each category was detailed in the staff report.

As part of its approval of the 2000 SCM, the Board resolution directed staff to:

- (1) monitor the progress of manufacturers in meeting the VOC limits in the SCM;
- (2) conduct technology assessments prior to the effective dates for each of the eleven proposed VOC limits that are lower than the predominant district limits currently in effect; and
- (3) propose any future modifications to the SCM that may be appropriate.

The eleven categories for which follow-up technology assessments are appropriate, because the limits are being lowered in district rules on January 1, 2003, or January 1, 2004, are: flats; nonflats; primers, sealers, and undercoaters; quick dry enamels; quick dry primers, sealers, and undercoaters; lacquers; stains; waterproofing sealers; industrial maintenance coatings; multicolor coatings; and swimming pool repair and maintenance coatings. Because the 250 g/l industrial maintenance limit will not go into effect until January 1, 2004, this category was not analyzed this year.

A very important component of the follow-up technology assessment is survey data, and we are fortunate to have the draft 2001 survey to help us assess technological feasibility. The 2001 survey, which is based on 2000 sales, contains more updated information than the 1998 survey, which was based on 1996 sales. However, the 2001 survey still does not reflect all of the reformulations and realignment of product lines associated with the district rules based on the SCM or the interim SCAQMD Rule 1113 limits. In fact, of the categories mentioned above, the only limits that were in effect in the SCAQMD in 2000 were the 550 g/l limit for lacquers, and the 250 g/l limit for multi-color coatings, both of which became effective in January 1998. The VOC limit for flats in the SCAQMD during 2000 was 250 g/l, since the 100 g/l limit became

effective in July 2001. The remainder of the new limits for the categories mentioned above became effective in the SCAQMD in July 2002.

As part of our technology assessments, we have considered results from two SCAQMD-sponsored performance test programs, the National Testing Systems (NTS) test program, and the KTA-Tator study. We also considered SCAQMD annual reports for 2000, 2001, and 2002, which include technology assessments. The SCAQMD's Essential Public Services agencies study of industrial maintenance coatings used for immersion, atmospheric, chemical containment, and roofing coating systems, and the Southern California Alliance of Publicly Owned Treatment Works (SCAP) study of coatings used at wastewater treatment plants, are both ongoing and no preliminary results have been released.

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Survey

The draft 2001 architectural coatings survey data were useful for the technology assessment for the SCM limits. Draft survey results for individual categories are included in the assessment for each category below.

SCAQMD Annual Reports to the Board

The SCAQMD staff prepares annual status reports on activities related to Rule 1113 in July of each year. In its 2000 report, the District staff reported on flat coatings (SCAQMD, 2000b). In 2001 and 2002, the District staff reported on: high gloss nonflats; floor coatings; stain-blocking primers, sealers, and undercoaters; and stains (SCAQMD, 2001; SCAQMD, 2002b).

In the 2000 report to the Board (SCAQMD, 2000b), SCAQMD staff concluded that the 100 g/l VOC limit for both interior and exterior flat coatings is feasible because complying coatings exist that meet or exceed the performance standards of paint manufacturers and end-users. The SCAQMD staff based this conclusion on the 1998 ARB survey, which showed that, based on sales, 71 percent of the interior flats and 30 percent of the exterior flats complied with the limit. The SCAQMD staff also cited data from the Master Painters Institute (MPI), which publishes standards based on federal specifications, and conducts laboratory testing on products submitted by manufacturers for inclusion in their approved product listings. MPI does not perform VOC analysis, however, but relies on information reported by manufacturers. The MPI listings as of May 2000 showed that a number of interior and exterior flat coatings listed complied with the 100 g/l VOC limit.

In the 2001 report to the Board (SCAQMD, 2001), the SCAQMD staff reported on categories for which the VOC limits in Rule 1113 are more stringent than in the SCM: nonflat high gloss coatings, and floor coatings. Specialty primers, sealers, and undercoaters were also evaluated, because in the SCM this category includes

stain-blocking coatings, while in Rule 1113 it does not. In addition, interior stains were evaluated, since industry has expressed concern about the feasibility of a 250 g/l limit for this subcategory. Based on the ARB's 1998 survey, about 3 percent of the volume of high gloss nonflats met the 150 g/l VOC limit in 1996. While the compliance rate is low, the SCAQMD staff pointed out that it was based on 1996 sales data, which was three years before the SCAQMD adopted the 150 g/l limit, and presumably before reformulation occurred. For floor coatings, 35 percent of the coatings met the 100 g/l limit, which the District staff concluded was adequate justification for the limit. The survey data showed that for primers, sealers, and undercoaters, 74 percent of the sales volume met the 200 g/l limit. The District staff contacted the large manufacturers of stain-blocking primers, since this category was not surveyed in 1998, and 12 products at or below 200 g/l were found. Finally, the ARB 1998 survey showed that 53 percent of the stains complied with the 250 g/l limit. The MPI product listings showed that compliant products existed for each category, except for interior semi-transparent stains. However, SCAQMD staff found product data sheets for seven complying products. The District staff also contacted several manufacturers, consultants, and end-users, to confirm that low-VOC coatings have been successfully formulated and used. In addition, the staff commented on a case study at Disney's California Adventure theme park, in which low-VOC coatings were used in the construction of the park. They reported that the coatings performed as expected, and that no failures occurred.

The SCAQMD staff reported in its 2002 report to the Board (SCAQMD, 2002b) that the OTC and 13 districts had adopted rules based on the interim limits of Rule 1113. In addition, the SCAQMD staff reported on the results of performance studies by NTS and KTA-Tator, both of which substantiated the feasibility of the limits. Finally, the District staff conducted a survey of paints being sold and used throughout the District, and generally found coatings that meet the current and future VOC limits. The exceptions were for coatings for which the rule provides exemptions or specific provisions allowing higher VOC products to be sold.

NTS Study

In 1998, to provide technical support for the 1999 amendments to Rule 1113, the SCAQMD contracted with NTS to test the most important performance characteristics of six coating categories: industrial maintenance coatings; nonflats; primers, sealers, and undercoaters; quick-dry enamels; quick-dry primers, sealers, and undercoaters; and waterproofing sealers. A Technical Advisory Committee (TAC), consisting of members from industry, academia, and government, was established to oversee contractor selection, choice of coatings, testing protocol, and analysis of results. An interim report of the laboratory testing results was released by the SCAQMD in April 1999, and ARB staff published a detailed analysis of the results in Appendix E of the 2000 SCM Staff Report (ARB, 2000a). The laboratory results showed that overall, the coatings complying with the VOC limits adopted in 1999 performed similarly to the higher-VOC, non-complying coatings. In addition to laboratory testing, accelerated exposure, real time exposure, and application characteristics studies were planned.

Following the completion of the laboratory studies, which included laboratory accelerated weathering tests, the SCAQMD staff found that the results of the accelerated outdoor weathering studies paralleled the results of the accelerated laboratory weathering study. The TAC also provided input on a NTS two-year real-time exposure study, initiated in April 2000, to evaluate the performance of coatings under ambient weathering conditions. Using the same paints evaluated in the laboratory study, coated panels were placed on exposure racks in Saugus, a hot, dry climate, and in El Segundo, a cool, humid, marine environment (SCAQMD 2000b). The tests were on zero-, low-, and high-VOC nonflat and industrial maintenance coating systems. The TAC made quarterly visual inspections of the panels, and these evaluations were consistent with the findings of the laboratory and accelerated outdoor exposure tests (SCAQMD, 2001). The real-time exposure testing was completed in April 2002. At the end of the two-year test, zero- and low-VOC nonflat and industrial maintenance coatings were noted to have similar weathering and durability characteristics as higher-VOC coatings. In some cases, the lower-VOC coatings outperformed the solvent-based coatings, as measured by gloss levels. The results of the study were summarized in Appendix B of the 2002 annual report. The District will place the panels at outdoor monitoring stations located near the original exposure sites, and will continue to evaluate the panels (SCAQMD, 2002b).

Essential Public Services Agencies Study

During the adoption of the 1999 amendments to Rule 1113, the SCAQMD Board directed staff to provide funding and oversee a technology assessment of coatings used to protect public structures, such as coatings used in components of power, municipal wastewater, and water transmission or distribution systems, as well as bridges and other roadways. The Essential Public Services Agencies (EPSA) Committee was formed, including representatives of the Metropolitan Water District (MWD), California Department of Water Resources, California Department of Transportation, Los Angeles' Department of Water and Power, and SCAP. The MWD was selected to perform the assessment for the agencies, since it has a corrosion testing laboratory and is experienced in this type of research (SCAQMD 2000b). SCAP later withdrew from the EPSA to conduct a separate study, addressing the service conditions specific to wastewater treatment facilities (SCAQMD, 2001).

The EPSA study, co-funded by the SCAQMD, is testing about 100 low-VOC industrial maintenance coatings designed to meet new construction and infrastructure maintenance requirements of public works. The study includes zinc primers, coal tar enamel repair coatings, chemical containment coatings, immersion coatings, traffic paints, roof coatings, and miscellaneous coatings. The test methods chosen will evaluate coating performance under harsh environmental conditions (SCAQMD, 2001). There are three phases in the project, each phase testing a different group of coatings. Although most of the coatings are currently undergoing testing, the EPSA Committee believes that interpretation of results from earlier phases of the study is premature.

Final results will be presented to the SCAQMD Board upon completion of the study (SCAQMD, 2001; SCAQMD, 2002b), hopefully in 2005.

SCAP Study

As mentioned above, SCAP is conducting its own independent study of coatings used in wastewater treatment plants. Members of SCAP include representatives of the Los Angeles County Sanitation District, Eastern Municipal Water District, Las Virgenes Municipal Water District, and the City of Los Angeles. In September 2000, SCAP contracted with KTA-Tator, Inc. to conduct a two-year laboratory and field study of low-VOC coatings. This study, which is scheduled to be completed in February 2003, will evaluate coatings exposed to the atmosphere and immersed in water (SCAQMD, 2001). The SCAQMD staff was not involved in the test design, evaluations, or interpretation of results of the SCAP study (SCAQMD, 2002b).

KTA-Tator Study

In conjunction with the TAC, the SCAQMD initiated another performance study to further substantiate earlier results that lower VOC products are acceptable to users. The contract was awarded to KTA-Tator, Inc., and focuses on a comparison of high- and low-VOC formulations for floor coatings; nonflat high gloss paints (exterior and interior); primers, sealers, and undercoaters (exterior and interior); and interior stains. These coatings were chosen because of differences between the SCM and Rule 1113, and because of industry concerns about the performance of these coatings. The contract was awarded in March 2001, and the final report was issued in July 2002. The results showed that low-VOC products are available, and perform as well as, or better than, higher-VOC products. In addition, these products are being sold in the marketplace, indicating consumer acceptance (SCAQMD, 2002b).

Research Plans

The ARB's Innovative Clean Air Technologies (ICAT) program funds technically sound projects that can provide innovative emission prevention or control technologies, and that are at the pilot, prototype, or demonstration stages of development. This year the ICAT funded a study by Southwest Texas State University for high-performance, low-VOC water-borne coatings (ICAT). In this project, soybean-based resins will be used to make industrial coatings with VOC contents of 100 g/l or less. Several manufacturers will formulate coatings using variants of the resins, so that durability and other performance characteristics can be evaluated.

The SCAQMD Research Plan (SCAQMD, 2002a) also includes \$250,000 for polymer research and low-VOC architectural coatings, in the 2003-2004 time frame. This project proposes to focus on hybrid polymers as a way to formulate low-VOC coatings that have the performance characteristics of traditional solvent-borne coatings. These single- or multi-component, high-solids, water-borne coatings should be compatible with

specific carriers, be non-hazardous, and have a viscosity that allows easy application of the coating to substrates.

The SCAQMD (SCAQMD, 2002a) has also budgeted \$50,000 in the 2003-2004 time frame to investigate how to reduce VOCs by end-users. This project involves testing new coating application equipment, using metalized spraying techniques and laser technologies, with the goal of improving transfer efficiencies onto the substrate. The study will test existing coatings and substrates, and will measure the overall quality of the paint job, the application rate, the desired film thickness, and the uniformity of the applied film.

ARB Technology Assessments

The ARB staff has evaluated the technological feasibility of lower limits for ten categories of coatings which go into effect in January 2003 for districts that have adopted the SCM. The most important new evidence in the technology assessments is the draft 2001 survey information. Results from the SCAQMD's NTS real-time weathering and KTA-Tator studies are also new since the Board approved the SCM. In addition, staff considered whether the categories were included in manufacturers' averaging programs, and whether any variances have been issued in the SCAQMD. (To date, SCAQMD staff report that no variances have been requested from SCAQMD limits that have gone into effect since 1999.) We also considered whether there was a difference in compliance of interior and exterior products (where applicable), and whether there were inequitable impacts on small businesses (defined as businesses that are independently owned and operated, and employ fewer than 250 people). If small businesses make complying products, we note this in the technology assessments, and conclude that the limits are not having inequitable impacts on small businesses.

In the technology assessments below, the following abbreviations are used:

SB = solvent-borne;

WB = water-borne;

SWA = sales-weighted average; and

VOC Reg = VOC regulatory.

Flats, 100 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	10	16,687	365	0.07	1	2 %
WB	3,536	36,629,587	97	16.53	2,518	73 %
Overall	3,546	36,646,274	97	16.60	2,519	73%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

For the flat category, the 73 percent complying marketshare represents a significant improvement compared to the 1998 survey (49 percent). The number of complying products from the 2001 survey (2,519) was also much higher than in the 1998 survey (1,097).

Complying marketshare (by volume) was also determined based on intended use (interior/exterior/dual). For the flat category, 86 percent of the volume that was intended for dual (interior/exterior) use complied with the 100 g/l VOC limit. For exterior uses, 78 percent complied, followed by interior uses (62 percent).

The survey identified more than 35 companies that manufacture compliant flat coatings. Some of the top manufacturers of compliant flat coatings are: Dunn-Edwards Corporation; Frazee Industries; The Glidden Company (ICI Paints NA); Kelly-Moore Paint Company, Inc.; and The Sherwin-Williams Company. The list also includes several small businesses, such as Cal Western Paints, Inc. and Triangle Coatings, Inc.

The high complying marketshare for flat coatings and the large number of manufacturers that produce compliant products support the conclusion that the VOC limit of 100 g/l is technologically feasible.

Lacquers, 550 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	365	373,836	622	2.40	53	18%
WB	73	69,437	260	0.09	73	100%
Overall	438	443,273	565	2.49	126	31%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

Although most of the category remains solvent-borne, the survey shows that there has been an increase in water-borne lacquers when compared with the 1998 survey reflecting 1996 data. The average VOC content of lacquers has decreased, and the complying marketshare has increased from 14 to 31 percent, when compared to the previous survey. This most likely reflects reformulation that manufacturers have undergone to comply with the 550 g/l limit in the SCAQMD in effect since 1998.

In addition to water-borne formulations, the survey shows that manufacturers have used exempt solvents, such as acetone, to help their solvent-borne formulations become compliant with the new limit. The use of these solvents has resulted in compliant products without sacrificing significant properties preferred by the wood finishing industry.

Several manufacturers make compliant interior coatings, including Frazee, Simpson Coatings Group, and Trinity Coatings Company. Vanex, Inc. makes compliant exterior or dual-purpose coatings. Three of these companies are small businesses.

The limit is feasible based on the complying marketshare, and successful implementation of a 550 g/l VOC limit in SCAQMD in 1998.

Multicolor Coatings, 250 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	1	PD	526	0.00	0	0%
WB	16	7,432	218	0.01	6	79%
Overall	17	PD	221	0.01	6	78%

PD means protected data because fewer than 3 companies reported sales.

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

The survey shows that the water-borne products are more prevalent now than in the 1998 survey. In the 1998 survey, the complying marketshare was 66 percent with 13 complying products. This improvement most likely reflects reformulation to meet the SCAQMD limit of 250 g/l, which became effective on January 1, 1998.

Complying products are made by: Multicolor Specialties, Inc., Surface Protection Industries, Inc., and Valspar Corporation. Two of the three companies are small businesses. None of the companies is participating in averaging, either statewide or in the SCAQMD. No comments were received during the districts' adoption of the SCM regarding the multicolor coatings category.

The limit is feasible based on the 78 percent complying marketshare, the fact that complying products are reported by three companies, and the successful implementation of a 250 g/l limit in the SCAQMD in 1998.

Nonflats (excluding high gloss), 150 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	306	529,301	318	1.90	1	0%
WB	3,657	29,928,405	165	22.24	2,210	47%
Overall	3,963	30,457,706	168	24.14	2,211	46%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

Sales in the nonflat category increased more than 50 percent from approximately 20 million gallons in 1996 to more than 30 million gallons in 2000. For the nonflat category, the percent complying marketshare from the 2001 survey (46 percent) represents a decrease compared to the 1998 survey (63 percent). However, the number of complying products in the 2001 survey (2,211) is significantly higher than in the 1998 survey (1,277). The decline in complying marketshare appears to be due to a large increase in the sales of one specific noncomplying coating from a single manufacturer. This coating, which represents more than 15 percent of the volume in this category, has a VOC value that is slightly higher than 200 g/l. In addition, three of the five top manufacturers in the nonflat category reported increases in their sales-weighted average VOC values, as compared to the data reported in 1998. Therefore, the sales-weighted average VOC for nonflats in 2001 (168 g/l) was higher than the 1998 values for nonflat – low gloss (134 g/l) and nonflat – medium gloss (155 g/l).

Complying marketshare (by volume) was also determined based on intended use (interior/exterior/dual). For the nonflat category, 65 percent of the volume that was intended for dual (interior/exterior) use complied with the 150 g/l VOC limit. For exterior uses, 57 percent complied, followed by interior uses (36 percent).

The survey identified more than 35 companies that manufacture compliant nonflat coatings. Some of the top manufacturers of compliant nonflat coatings are: Dunn-Edwards Corporation; Frazee Industries; The Glidden Company (ICI Paints NA); Kelly-Moore Paint Company, Inc.; and The Sherwin-Williams Company. The list also includes several small businesses, such as Textured Coatings of America, Inc. and Life Paint Corporation.

NTS tested various nonflat coatings in a 24-month actual exposure/weathering study at two locations in the Los Angeles area (El Segundo and Saugus). Coatings were rated on a scale of 1 to 5, with 1 being the best and 5 being the worst. The study included the following coating systems (primer and topcoat equal a system), as applied to a wood substrate:

- Four very low-VOC nonflats (topcoat \leq 150 g/l)
- Four low-VOC nonflats (topcoat \leq 250 g/l);
- Three high-VOC quick dry enamels (topcoat $>$ 250 g/l);

(Note: Only one of the quick dry enamels mentioned above actually met the SCM gloss and dry time criteria for the quick dry enamel category. However, one of the low-VOC nonflats met the quick dry enamel criteria.)

After 18 months of actual exposure, all of the high-VOC quick dry enamels received poor quality ratings. At El Segundo, three of the four very low-VOC nonflats and three of the four low-VOC nonflats were of good quality (i.e., received ratings of 1 or 2). At Saugus, three of the four very low-VOC nonflats and three of the four low-VOC nonflats were of passable quality (i.e., received ratings of 1-3). Based on these preliminary

results, the low-VOC nonflats and the very low-VOC nonflats performed better than the high-VOC quick-dry enamels.

The MPI has compiled an Approved Product List that includes numerous nonflat coatings that meet the 150 g/l VOC limit. The Approved Product List contains those coatings that have met the criteria in MPI's standards. Listed below is the number of products identified, as of August 2002, for various nonflat categories:

MPI Category	Number of Approved Products (≤ 150 g/l)	Number of Manufacturers
MPI #11 Exterior Latex, Semi-Gloss	6	6
MPI #15 Exterior Latex, Low Sheen	5	5
MPI #43 Interior Latex, Gloss Level 4	3	3
MPI #44 Interior Latex, Gloss Level 2	31	24
MPI #52 Interior Latex, Gloss Level 3	8	8
MPI #54 Interior Latex, Semi-Gloss	15	14
MPI #138 High Performance Architectural Latex – Gloss Level 2	3	2
MPI #139 High Performance Architectural Latex – Gloss Level 3	1	1
MPI #141 High Performance Architectural Latex – Gloss Level 5	2	2
MPI #144 Institutional Low Odor/VOC Interior Latex – Gloss Level 2	6	6
MPI #147 Institutional Low Odor/VOC Interior Latex – Gloss Level 5	7	7

Although complying marketshare has declined in the nonflat category, there is still a significant portion of coatings that comply with the 150 g/l VOC limit. The complying marketshare, the large number of manufacturers that produce compliant products, and the NTS exposure results support the conclusion that the VOC limit of 150 g/l is technologically feasible.

Primers, Sealers, and Undercoaters, 200 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	285	1,295,966	332	4.78	10	11%
WB	628	6,959,992	116	3.43	531	95%
Overall	913	8,255,958	150	8.21	541	82%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

For the primers, sealers, and undercoaters category, the 82 percent complying marketshare from the 2001 survey represents an improvement, as compared to the

1998 survey (74 percent). The number of complying products from the 2001 survey (541) was also higher than in the 1998 survey (445).

Complying marketshare (by volume) was also determined based on intended use (interior/exterior/dual). For the primers, sealers, and undercoaters category, 85 percent of the volume that was intended for interior use complied with the 200 g/l VOC limit. For dual (interior/exterior) use, 83 percent complied, followed by exterior use (72 percent).

The survey identified more than 55 companies that manufacture compliant primers, sealers, and undercoaters. Some of the largest manufacturers of compliant coatings are: Behr Process Corporation; Dunn-Edwards Corporation; Frazee Industries; The Glidden Company (ICI Paints NA); and The Sherwin-Williams Company. The list also includes several small businesses, such as Catalina Industries, Inc.; Life Paint Corporation; and San Luis Paints.

The KTA-Tator study compared the performance of interior and exterior formulations of primers, sealers, and undercoaters. For both interior and exterior applications, they designated three coatings that met the 200 g/l limit and three coatings that exceeded the 200 g/l limit. Testing was performed for a variety of parameters and results are summarized below:

Interior primers, sealers, and undercoaters:

For adhesion, chemical resistance, drying time, grain raising, hiding, and sag resistance, the lower-VOC primers, sealers, and undercoaters were rated comparable to or better than the higher-VOC primers, sealers, and undercoaters.

For sandability, two of the three lower-VOC coatings were rated equivalent to the higher-VOC coatings. The lower-VOC coatings were rated lower than the higher-VOC coatings for freeze/thaw resistance.

Exterior primers, sealers, and undercoaters:

For adhesion, drying time, grain raising, hiding, sag resistance, and weathering, the lower-VOC primers, sealers, and undercoaters were rated comparable to or better than the higher-VOC primers, sealers, and undercoaters.

For tannin stain blocking, two of the three lower-VOC coatings were rated equivalent to the higher-VOC coatings. The lower-VOC coatings exhibited good freeze/thaw resistance.

The MPI has compiled an Approved Product List that includes numerous primers, sealers, and undercoaters that meet the 200 g/l VOC limit. The Approved Product List contains those coatings that have met the criteria in MPI's standards. Listed below is the number of products identified, as of August 2002, for various primers, sealers, and undercoaters:

MPI Category	Number of Approved Products (<= 200 g/l)	Number of Manufacturers
MPI #6 Exterior Latex Wood Primer	31	23
MPI #17 Bonding Primer (water-based)	13	13
MPI #39 Interior Latex-based Wood Primer	7	7
MPI #50 Interior Latex Primer Sealer	36	31
MPI #125 Primer Sealer (for multi color systems)	7	7
MPI #137 Stain Blocking Primer, W.B.	7	5

The high complying marketshare for primers, sealers, and undercoaters and the large number of manufacturers that produce compliant products support the conclusion that the VOC limit of 200 g/l is technologically feasible. The KTA-Tator study confirms that the performance of low-VOC primers, sealers, and undercoaters is generally equivalent to higher-VOC products.

Quick Dry Enamels, 250 g/l

Draft 2001 survey results are as follows:

Quick Dry Enamels

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	151	588,130	361	2.39	47	10%
WB	15	PD	234	0.02	15	100%
Overall	166	PD	358	2.41	62	12%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart. PD = Protected Data. Fewer than three companies reported sales.

For the quick dry enamel category, the 12 percent complying marketshare from the 2001 survey represents an improvement, as compared to the 1998 survey (zero percent). The number of complying products from the 2001 survey (62) was significantly higher than the 1998 survey (1).

The 2001 survey gathered data on product names and product codes which was not collected in previous surveys. Using these new data, staff was able to improve the level of quality control by reviewing product names and consulting with manufacturers to ensure that the proper coating category had been reported. ARB staff reviewed product information and found several coatings that were reported as quick dry enamels, but did not meet the dry time criteria and/or the gloss criteria. These coatings were assigned to a more appropriate category (e.g., nonflat – high gloss), which substantially reduced the volume of quick dry enamels, as compared to the 1998 survey. The volume of solvent-borne quick dry enamels (excluding quarts) declined approximately 30 percent from the volume in the 1998 survey.

Survey results are also provided for the nonflat – high gloss category, because some of these coatings meet the criteria for quick-dry enamel.

Nonflat – High Gloss Coatings

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	308	567,445	336	2.15	30	31%
WB	542	1,340,755	202	1.38	475	98%
Overall	850	1,908,200	241	3.53	505	78%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

For the nonflat – high gloss category, the 78 percent complying marketshare from the 2001 survey represents a slight decline, as compared to the 1998 survey (80 percent). This decline is a result of the quality control effort for the quick dry enamel category. Some coatings had been reported as quick dry enamels, when they should have been reported as nonflat – high gloss coatings. These coatings, which generally exceeded 250 g/l, were shifted to the nonflat – high gloss category, thereby increasing the sales-weighted average VOC and causing a slight reduction of the complying marketshare. The number of complying products from the 2001 survey (505) was much higher than in the 1998 survey (333).

Complying marketshare was also determined based on intended use (interior/exterior/dual). For the quick dry enamels, 20 percent of the volume that was intended for dual (interior/exterior) use complied with the 250 g/l VOC limit. No complying products were identified as being intended only for interior use or exterior use.

The survey identified two companies that manufacture compliant quick dry enamels: Vanex, Inc. and Vista Paint Corporation. Vanex, Inc. is a small business.

The quick dry enamel category was created more than ten years ago to allow for high-gloss, quick-drying, solvent-borne, alkyd coatings to remain on the market. Water-borne products have typically not been marketed as quick-dry enamels, even though there are water-borne nonflats that meet the gloss and drying time requirements. Accordingly, it is not surprising that the quick dry enamel category has a relatively low complying marketshare for a 250 g/l limit, based on the 1998 and 2001 survey results. As explained in the SCM staff report (ARB, 2000a), we expect that most solvent-borne alkyd products will be reformulated as water-borne products, or existing water-borne nonflat – high gloss coatings will meet this market demand. In addition, with the approval of the SCM in June 2000, the ARB intended for districts to eventually eliminate the quick dry enamel category in favor of the nonflat – high gloss category, which has the same limit of 250 g/l.

Based on the NTS laboratory results, summarized in the SCM staff report, all of the nonflat coatings, including two compliant and two non-compliant nonflat – high gloss coatings, had drying times that met the criteria for quick dry enamels. In addition, the compliant nonflat coatings performed similarly to the high-VOC coatings.

In addition to laboratory testing, NTS tested various coatings in a 24-month actual exposure/weathering study at two locations in the Los Angeles area (El Segundo and Saugus). Coatings were rated on a scale of 1 to 5, with 1 being the best and 5 being the worst. The study included the following coating systems (primer and topcoat equal a system), as applied to a wood substrate:

- Four very low-VOC nonflats (topcoat \leq 150 g/l)
- Four low-VOC nonflats (topcoat \leq 250 g/l);
- Three high-VOC quick dry enamels (topcoat $>$ 250 g/l);

(Note: Only one of the quick dry enamels mentioned above actually met the SCM gloss and dry time criteria for the quick dry enamel category. However, one of the low-VOC nonflats met the quick dry enamel criteria.)

After 18 months of actual exposure, all of the high-VOC quick dry enamels received poor quality ratings. At El Segundo, three of the four very low-VOC nonflats and three of the four low-VOC nonflats were of good quality (i.e., received ratings of 1 or 2). At Saugus, three of the four very low-VOC nonflats and three of the four low-VOC nonflats were of passable quality (i.e., received ratings of 1-3). Based on these preliminary results, the low-VOC nonflats and the very low-VOC nonflats performed better than the high-VOC quick dry enamels.

The survey identified more than 60 products that were categorized as “quick dry enamels” and met the VOC limit of 250 g/l. In addition, a review of available product data sheets resulted in the identification of more than 20 products equaling more than 590,000 gallons from the survey that met the 250 g/l limit and were classified as “nonflat – high gloss,” but could potentially be marketed as “quick dry enamels,” based on dry time and gloss characteristics.

The number of compliant products currently available, the NTS exposure results, and the high complying marketshare of the nonflat – high gloss category support the conclusion that the VOC limit of 250 g/l is technologically feasible, especially since we believe that the nonflat – high gloss category should supplant the quick dry enamel category.

Quick Dry Primers, Sealers, and Undercoaters, 200 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	94	1,226,662	434	6.05	5	0%
WB	27	384,677	146	0.25	23	93%
Overall	121	1,611,339	365	6.31	28	22%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

For the quick dry primers, sealers, and undercoaters category, the 22 percent complying marketshare from the 2001 survey represents a decrease compared to the 1998 survey (35 percent). However, the number of complying products from the 2001 survey (28) was higher than in the 1998 survey (19). The decline in complying marketshare appears to be due to a change in the types of coatings sold by the primary manufacturer in this category. In the 1998 survey, the largest manufacturer in this category produced mostly water-borne quick dry primers, sealers, and undercoaters. In the 2001 survey, this manufacturer produced primarily solvent-borne quick dry primers, sealers, and undercoaters, which resulted in an increase of the sales-weighted average VOC value and a decrease in complying marketshare.

Complying marketshare (by volume) was also determined based on intended use (interior/exterior/dual). For the quick dry primers, sealers, and undercoaters category, 38 percent of the volume that was intended for dual (interior/exterior) use complied with the 200 g/l limit. For exterior uses, one percent complied, followed by interior use (zero percent).

The survey identified six companies that manufacture compliant quick dry primers, sealers, and undercoaters. These manufacturers include Wm. Zinsser & Co.; Triangle Coatings, Inc.; United Coatings; and W.R. Grace & Co.-Connecticut. Triangle Coatings, Inc., and United Coatings are small businesses.

The quick dry primers, sealers, and undercoaters category was created more than ten years ago to allow for quick-drying, solvent-borne, alkyd coatings to remain on the market. Water-borne products have typically not been marketed as quick dry primers, sealers, and undercoaters, even though there are water-borne primers, sealers, and undercoaters that meet the gloss and drying time requirements. Accordingly, it is not surprising that the quick dry primers, sealers, and undercoaters category has a relatively low complying marketshare for a 200 g/l limit, based on the 1998 and 2001 survey results. As explained in the SCM staff report (ARB, 2000a), we expect that most solvent-borne alkyd products will be reformulated as water-borne products, or existing water-borne primers, sealers, and undercoaters will meet this market demand. In addition, with the approval of the SCM in June 2000, the ARB intended for districts to eventually eliminate the quick dry primers, sealers, and undercoaters category in favor

of the primers, sealers, and undercoaters category, which has the same limit of 200 g/l. Alternatively, some of these products may be marketed as specialty primers, sealers, and undercoaters with a VOC limit of 350 g/l.

Based on the NTS laboratory results, summarized in the SCM staff report, many of the compliant primers, sealers, and undercoaters had drying times that met the criteria for quick dry primers, sealers, and undercoaters. Overall, these low-VOC compliant products exhibited similar performance characteristics as high-VOC products.

The complying marketshare for quick dry primers, sealers, and undercoaters, and the high complying marketshare of the primers, sealers, and undercoaters category, support the conclusion that the VOC limit of 200 g/l is technologically feasible. The staff expects the quick dry primers, sealers, and undercoaters category to be phased out, with products being classified as either primers, sealers, and undercoaters or specialty primers, sealers, and undercoaters, as explained in the SCM staff report.

Stains, 250 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	1198	1,559,287	356	6.33	17	2%
WB	545	1,256,951	152	0.82	443	84%
Overall	1743	2,816,238	265	7.15	460	39%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

Stains can be semi-transparent or opaque coating products designed and formulated to change the color of a surface but not conceal the grain pattern or surface texture. Semi-transparent stains will add color to the surface without concealing its natural grain pattern and surface texture. Opaque stains completely conceal the color variations of the grain pattern while allowing the texture of the surface to be seen.

Overall, the complying marketshare decreased since the 1998 survey. This was due primarily to an increase of sales of non-complying, solvent-borne, clear/semi-transparent stains. A combination of increasing sales of previous non-complying products, and the introduction of new non-complying products, accounts for this increase. New non-complying products account for more than 25 percent of the non-complying clear/semi-transparent stains volume. Interior clear/semi-transparent stains has been the subcategory that some members of industry have expressed the most concern about being able to meet the 250 g/l limit. Based on the 2001 draft survey results, interior clear/semi-transparent stains had over 30 percent compliance with the 250 g/l limit. The survey showed that close to 75 percent of the opaque stains, which are primarily exterior stains, complied with the 250 g/l VOC limit.

In 2001, a study that examined the performance of interior clear/semi-transparent stains that complied with the new limit versus interior stains that did not comply with the new limit was conducted by KTA-Tator for SCAQMD. A joint committee of industry and regulatory representatives developed the procedures of the test, and were consulted by KTA-Tator throughout the design, execution, and reporting of the study. The study concluded that the interior clear/semi-transparent stains that were classified below 250 g/l performed equivalent to, or in some cases better than, stains classified above the 250 g/l limit. This conclusion was based on the results of tests that the committee determined were important to the overall performance and quality of a stain coating.

Review of the latest survey shows that there are several products that currently comply with the 250 g/l limit, in both the clear/semi-transparent and opaque categories, and for both interior and exterior use. This includes products made by Okon Inc., Behr, EPMAR Corporation and the Armstrong-Clark Company. Two of these companies are small businesses. In addition, the two companies that have submitted a statewide averaging program to ARB have not included stains in their program.

The limit is feasible based on the complying marketshares for the overall category, for the exterior opaque stains, and for the interior clear and semi-transparent stains. In addition, for clear and semi-transparent stains, the KTA-Tator study results support the limit.

Swimming Pool Repair and Maintenance Coatings, 340 g/l

Draft 2001 survey results are as follows:

Swimming Pool Repair and Maintenance Coatings

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	7	15,046	573	0.10	0	0%
WB	N/A	N/A	N/A	N/A	N/A	N/A
Overall	7	15,046	573	0.10	0	0%

N/A means no water-borne products were reported on the survey.

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

Swimming Pool Coatings

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	16	12,207	322	0.04	12	87%
WB	16	9,628	216	0.01	16	100%
Overall	32	21,835	276	0.05	28	93%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

Swimming pool repair and maintenance coatings, made with rubber-based resins, are being phased out in favor of swimming pool coatings formulated with epoxy or acrylic resins. All of the products in the swimming pool repair and maintenance category were reported as being formulated with chlorinated rubber, which cannot be reformulated to comply with the 340 g/l limit. On the other hand, 93 percent of the coatings reported as being formulated with epoxy or acrylic resins (in the swimming pool coatings category) did comply.

As reported in the June 2000 staff report (ARB, 2000a), the epoxy formulations offer several advantages over the rubber-based products, and the sales of epoxies and acrylics already surpass the sales of chlorinated rubber, even though the 340 g/l limit is not in effect in the SCAQMD. The 340 g/l limit for swimming pool repair and maintenance coatings has been in effect since 1997 in five districts (Imperial, Sacramento, San Joaquin Valley, Santa Barbara, and Ventura). No comments were received on the swimming pool repair and maintenance category during the districts' adoption of the SCM.

Companies making complying products (in the swimming pool coatings category) include Ellis Paint Company, INSL-X Products Corporation, Kelley Technical Coatings, and Leslie's Poolmart. Three of the four companies fall under the small business classification.

The 340 g/l limit for swimming pool coatings is feasible based on the 93 percent complying marketshare, and the fact that four companies make complying coatings. It appears that there is no need for a swimming pool repair and maintenance category in future SCMs.

Waterproofing Sealers, 250 g/l

Draft 2001 survey results are as follows:

	Number of Products	Sales (gallons)	SWA VOC Reg (g/l)	Emissions (tons per day VOCs)	Number of Complying Products	Complying Marketshare
SB	104	438,990	332	1.58	14	16%
WB	122	550,993	185	0.26	92	59%
Overall	226	989,983	250	1.84	106	40%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

The draft 2001 survey shows that water-borne coatings account for a greater percentage of the overall sales than in the 1998 survey. The complying marketshare has increased from 13 percent in the 1998 survey to 40 percent in the 2001 survey, and the average VOC has decreased from 336 g/l to 250 g/l. Review of the latest survey indicates that a large portion of the non-complying marketshare is represented by a

single product. This product has a VOC content close to the 250 g/l limit, and could possibly be reformulated to meet the new limit.

Staff has conducted searches for waterproofing sealers that meet the VOC limit of 250 g/l and found several manufacturers that have compliant products available. Complying products are made by Degussa Construction Corporation, The Sherwin-Williams Company, Life Paint Company, and Glaze 'N Seal Products. Two of these companies are small businesses. In addition, the two companies that have submitted a statewide averaging program to ARB have not included waterproofing sealers in their programs.

The limit of 250 g/l is feasible based on the complying marketshare, the decrease in average VOC content, and the variety of complying products currently available.

Conclusion

As a result of these assessments, we conclude that all of the 2003 limits are technologically feasible by January 1, 2003, and that no modifications to the SCM's limits are needed at this time.

Calculation of Reportable VOC Content

Background

Since the 1970s the U.S. EPA has required, for SIP rules, that the VOC content of coatings be calculated on a “less water and exempt compounds” basis (also called “VOC regulatory”). For a coating containing a large amount of water or exempt compounds, the effect of this calculation is that the VOC regulatory is a larger number than if the “less water and exempts” calculation had not been required (also called “VOC actual”). For example, in a water-borne coating containing 50 percent water, the calculated VOC regulatory is twice as high as the actual VOC content of the coating. Since VOC regulatory is what is used to determine compliance with the VOC limit, the “less water and exempts” calculation is controversial. The rationale for this calculation is that it provides an equivalent basis for comparing the polluting portion of solvent-borne, water-borne, and exempt solvent-containing coatings. The formula is intended to represent the ratio between the VOC and solids in a coating, so the emissions per surface area are directly comparable for all types of coatings.

To address comments regarding this issue during the development of the SCM and testimony at the June 2000 Board hearing, the ARB staff formed a Less Water Working Group consisting of stakeholders from the U.S. EPA, industry, and air districts. An analysis of this issue, in Enclosure 2 of the June 2001 Board memo (Kenny, 2001b), shows that an underlying issue is the validity of the assumption that the solids content of the paint is directly related to the amount of surface covered. Answering this question would enable us to determine which calculation method, VOC regulatory or VOC actual, is more appropriate.

Status Report

The Less Water Working Group met in July 2002 as a kick-off to a new research project. In September 2001, the Board approved funding for a study of the relationship between solids content of a coating and coverage or hiding, as a way of addressing the need for the VOC regulatory calculation (Censullo et al., 2001). The contract is scheduled for completion in January 2004.

At the kick-off meeting for this research project, manufacturers made several suggestions regarding the design of the study, such as including more commercial solvent-borne paints, deleting some of the variables and testing procedures, and varying film thickness as one of the variables. The researchers will now incorporate these suggestions into the test design. The test design will be forwarded to ARB for approval, and another call with the Working Group will occur.

We believe the results of this study will provide insight into how much VOC is required to adequately hide a substrate, and ultimately help address the issue of whether VOC content should be expressed as VOC actual or VOC regulatory, or some other expression.

Exempt Solvents

Background

The issue of the availability of parachlorobenzotrifluoride (PCBTF) was brought up at the June 2000 Board hearing on the SCM. Districts have exempted PCBTF in their architectural coating rules, and a few manufacturers have been using this exempt solvent in architectural coatings. In May 2000, Oxychem, the only domestic manufacturer of PCBTF, announced that it was discontinuing production of this solvent (trade name Oxsol® 100) and selling its plant. Staff reported in the June 2001 Board Update (Kenny, 2001b) that the supply was never interrupted due to a large carryover of Oxsol® 100, and that there were ample foreign supplies. At that time, Oxychem was negotiating with potential buyers regarding purchase of its Oxsol® 100 plant.

Status Report

Makhteshim Agan Industries, an Israeli manufacturer of specialty chemicals, purchased the Oxsol® business from Oxychem in January 2002. The purchase included the intellectual property, know-how, trademarks, literature, patents, and the remaining stocks of the product. The product is now manufactured in Brazil to Oxychem standards, and is distributed by Makhteshim Agan's North America Division, MANA. The price is similar to historical levels, and the supply is stable (Rowe, 2002).

The 2001 architectural coatings survey showed that a minimal amount of PCBTF is used in architectural coatings.

Feasibility of Reactivity-Based Standards

Background

The staff reported on progress in investigating the feasibility of a reactivity-based control strategy for architectural coatings in the June 2001 update to the Board (Kenny, 2001b). For the current report, the Board directed staff to provide an update on the development of a reactivity-based control strategy, including the advantages and disadvantages of a reactivity-based control approach relative to a traditional mass-based control approach.

The ARB has pioneered the use of reactivity in regulations controlling VOC emissions. In 1991, the Board adopted the Low Emission Vehicles and Clean Fuels regulation (ARB, 1990), that allowed for the use of reactivity adjustment factors. In June 2000, the Board adopted a reactivity-based regulation for aerosol coatings (ARB, 2000c).

Status Report

Architectural Coatings Research

The Board has approved funding of \$300,000 for architectural coatings reactivity research. Dr. William P. L. Carter of the University of California, Riverside, has begun a three-year study aimed at improving the estimates of ozone formation from emissions of VOCs found in architectural coatings.

The objectives of this contract are as follows:

- (1) development and evaluation of procedures for quantifying the reactivities of selected petroleum distillate mixtures ("mineral spirits"), important ingredients in solvent-borne coatings;
- (2) further development of the direct reactivity assessment method for possible use with coatings constituents; and
- (3) conducting environmental chamber experiments on 2,2,4-trimethyl-1,3-pentanediol isobutyrate (Texanol®, a product of Eastman Chemical), an important coalescing solvent used in water-based paints, and four or five petroleum distillates.

In the first quarterly progress report (Carter, 2002), Dr. Carter reported on activity regarding the objectives. The first task involved analyzing available detailed compositional data for petroleum distillates currently used in architectural coatings, and developing a systematic procedure to derive estimates of reactivity for these mixtures. Dr. Carter obtained speciated compositional data from the American Chemistry Council (ACC) Hydrocarbon Panel on about 30 representative distillates, and was able to make reactivity estimates. However, the data are considered proprietary and non-publishable at this time.

Dr. Carter also obtained summary compositional information (carbon number distribution, boiling point ranges, and general chemical class information) and detailed speciation by gas chromatography for the 42 distillates analyzed in a study by Censullo, et al. (2002). Maximum incremental reactivities (MIRs) were calculated based on the summary compositional information and on the detailed speciation. The analysis showed that the composition based on chemical class and carbon numbers is not sufficient to characterize reactivities, especially for aromatic distillates, but detailed speciation data are sufficient, even for aromatics. Work will continue on developing a standard spreadsheet format and developing the reactivity analysis procedures. Also, as additional samples or compositional data become available, this information will be added to the spreadsheet.

The second task for which progress was made was improving the “direct reactivity” method for measuring the reactivity of VOCs (Carter and Malkina, 2002). In the atmosphere, the reactions of a VOC and its products can contribute directly to the formation of ozone; these processes are known as direct reactivity. Through previous work, Dr. Carter determined that this method could be useful to inexpensively evaluate reactivities of coating VOCs, particularly low volatility Texanol® and petroleum distillate mixtures. The method is based on irradiation of the test VOC with nitrous oxide (HONO). Previous work has shown that gas chromatographic methods of measuring the amount of VOC injected into an environmental chamber do not work well for these materials, and that a total carbon analysis interface to the existing system is needed. With this method, a catalytic combustor converts all organic compounds to carbon dioxide, then a carbon dioxide analyzer measures the amount of carbon combusted. Preliminary results show that the catalyst system is quite sensitive, and the method works well with higher volatility compounds, thus eliminating the need for analysis by gas chromatography. However, modifications to the hardware need to be made before the system can be used for low volatility compounds. Work will continue on improving the total carbon analysis system for integration into the HONO flow system. A decision will be made soon as to whether the system will be satisfactory for use with the low volatility compounds of interest.

Dr. Carter also reported on progress in preparing the next generation environmental chamber so it can be used for this project. The chamber is nearing completion. Most of the instruments and equipment needed have been acquired, but some are being evaluated, while others did not perform satisfactorily and are being redesigned. The reactor lights have proven to be particularly challenging. A temporary chamber has been set up to test equipment, while waiting for the modified lights to be delivered. The sampling and mixing system is under construction, in preparation for the final chamber. Finally, a quality assurance plan, data processing procedures, and standard operating procedures are being developed. The first characterization experiments of aspects of the final chamber began in July 2002.

Research on Distillates

One of the challenges in developing a reactivity-based control strategy for architectural coatings is determining the ozone forming potential of petroleum distillates. These compounds are the largest single class of solvents used in solvent-borne architectural coatings, so the impact of their reactivity needs to be quantified. The ARB's aerosol coatings regulation references tables of MIRs for organic compounds and hydrocarbon solvents. While a binning system is in place to reliably predict the reactivity of hydrocarbon solvents, including petroleum distillates, as a longer-term goal we hope to conduct research to develop discrete MIRs for various important hydrocarbons. The first step in this process is to conduct chamber experiments.

The Reactivity Research Advisory Committee (RRAC) consists of representatives from the solvent, consumer products, and coatings industries, trade groups, educational institutions and government agencies. The RRAC oversees reactivity research needs for the consumer products and architectural coatings programs to help the ARB develop reactivity-based control strategies. The RRAC is providing input to us in selecting the petroleum distillates to test in the new chamber.

Based on the distillates reported in the ARB's 1998 architectural coatings survey and informal input from major manufacturers, staff proposed the following list of compounds to the RRAC at its August 2001 meeting:

- medium aliphatic solvent naphtha
- Stoddard solvent
- VM & P naphtha
- petroleum naphtha
- heavy alkylate
- Aromatic 100
- distillate (petroleum), hydrotreated light
- hydrotreated heavy naphtha
- kerosene
- petroleum ether

At the June 2002 RRAC meeting, the ACC's Hydrocarbon Solvents Panel recommended the following list of compounds for chamber studies:

- low aromatic mineral spirits
- Stoddard solvent (15-20% aromatic mineral spirits)
- VM & P naphtha
- D60 (142 flash) mineral spirits
- Aromatic 100
- odorless mineral spirits
- short range mineral spirits
- 7% aromatic mineral spirits
- heptane
- Aromatic 150

- mixed xylenes
- D80 mineral spirits

While there are similarities in these two lists, there are also significant differences. There are also more compounds listed than can be tested in the current research project. Thus, at its June 2002 meeting, the RRAC recommended waiting for the results of the ARB's 2001 survey to make the final choices for the chamber runs. ARB staff also asked manufacturers to recommend the top five distillates to be studied, based on the ACC's list. Because of delays in survey submittals and significant follow-up work to analyze the petroleum distillate ingredient data from the ARB's 2001 survey, these data will not be ready by the end of 2002. Accordingly, the initial petroleum distillate choices will most likely be primarily based on manufacturers' top picks, with possibly one or two obvious high use distillates based on the 2001 survey.

Advantages of a Reactivity-Based SCM for Architectural Coatings

Many of the elements of a successful reactivity program are met with architectural coatings. Architectural coatings are a discrete and well-defined emissions source category; liquid paints sold for use on stationary structures are easily recognizable and distinct. The ARB 2001 architectural coatings survey gathered detailed sales information and speciation of VOCs in product formulations, with ingredients reported to the 0.1 weight percent level. The reactivities of many VOC ingredients used in architectural coatings are already well characterized. Several manufacturers have expressed interest in working with us on a reactivity-based SCM.

There are several incentives to develop a reactivity-based control strategy. Mass-based emission reductions are becoming more difficult because architectural coatings are already more than 80 percent water-borne. Thus, reactivity-based limits offer a new opportunity to achieve additional ozone reductions. We expect an equal or greater air quality benefit compared to a mass-based strategy, because VOCs with the greatest ozone forming potential will be targeted rather than treating each VOC equally.

The reformulation options may be greater with a reactivity-based strategy. At the same time, there should be less tendency for lower reactive solvents to be replaced with higher reactive or toxic solvents to lower the total VOC content. For example, we would expect to see less use of some toxic compounds, such as xylene and toluene, because of their high reactivity.

There are also advantages associated with enforceability. There will no longer be a need to consider U.S. EPA's and ARB's exempt VOCs based on negligible reactivity, since the reactivity of all VOCs is counted and nothing is exempt. The "less water and exempts" calculation, discussed above, may cease to be an issue, since limits may be expressed in units other than grams of VOC per liter of coating, less water and exempt compounds.

Disadvantages of a Reactivity-Based SCM for Architectural Coatings

There are implications for both the regulatory agencies and the manufacturers if we go forward with a reactivity-based SCM for architectural coatings. Architectural coatings are regulated by districts, and a significant resource commitment by the ARB may be required to help districts implement a more complex reactivity-based regulation.

Since more than 80 percent of the market is already water-borne, and relatively low reactive mineral spirits dominate the VOCs in solvent-borne coatings, there may not be much opportunity to reformulate with lower-reactive solvents. We will need to analyze whether acceptable substitutes (on technical, economic, and health impact levels) are available for the highly reactive solvents used in architectural coatings, if mandatory reactivity-based limits are proposed.

Any reactivity-based strategy would evaluate the potential uses of toxic compounds. Because toxic compounds such as methylene chloride and perchloroethylene may have a potential increased use due to their low reactivity, we may need to cap current uses and potentially ban new uses of these chemicals.

Conclusion

Since the adoption of the SCM in June 2000, the architectural coatings industry has expressed interest in a reactivity-based control strategy. Consequently, the ARB is sponsoring research to improve the reactivity estimates for VOCs used extensively in architectural coatings. ARB will also be analyzing the data from the 2001 survey to determine baseline reactivities of architectural coatings. The research is scheduled to be completed in 2005. At that time, we will assess the feasibility of developing a reactivity-based SCM.

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